

Cone size and jet resolutions

I consider only two highest E_T particle level jets in a di-jet pp event. Particle jets include neither neutrinos, muons, nor pile-up particles and are found with the iterative cone algorithm implemented in ORCA using either cone size R=0.5 or R=0.7.

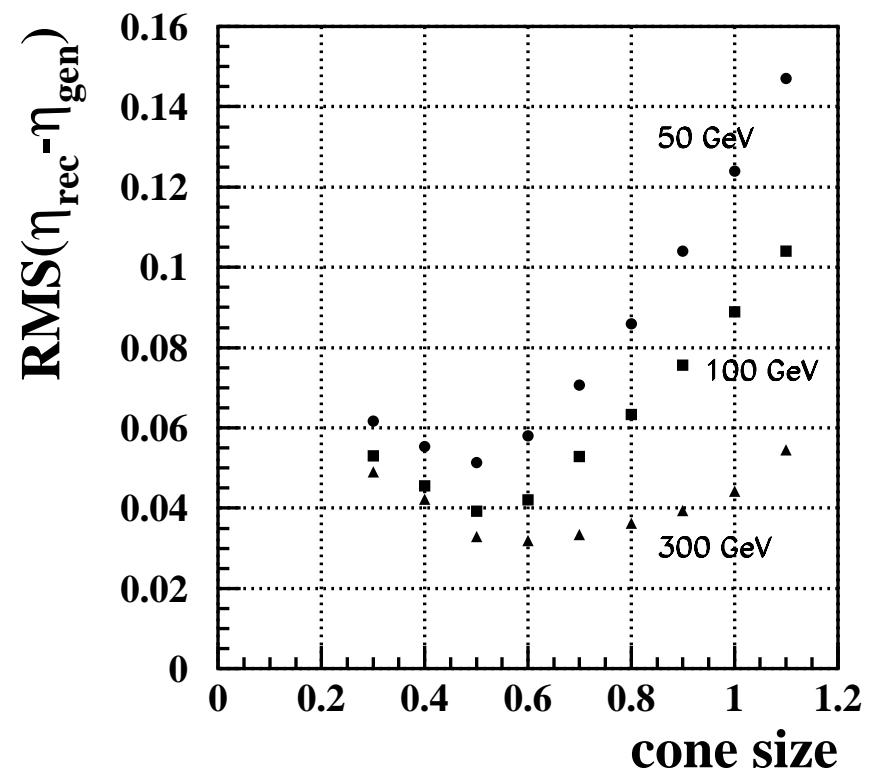
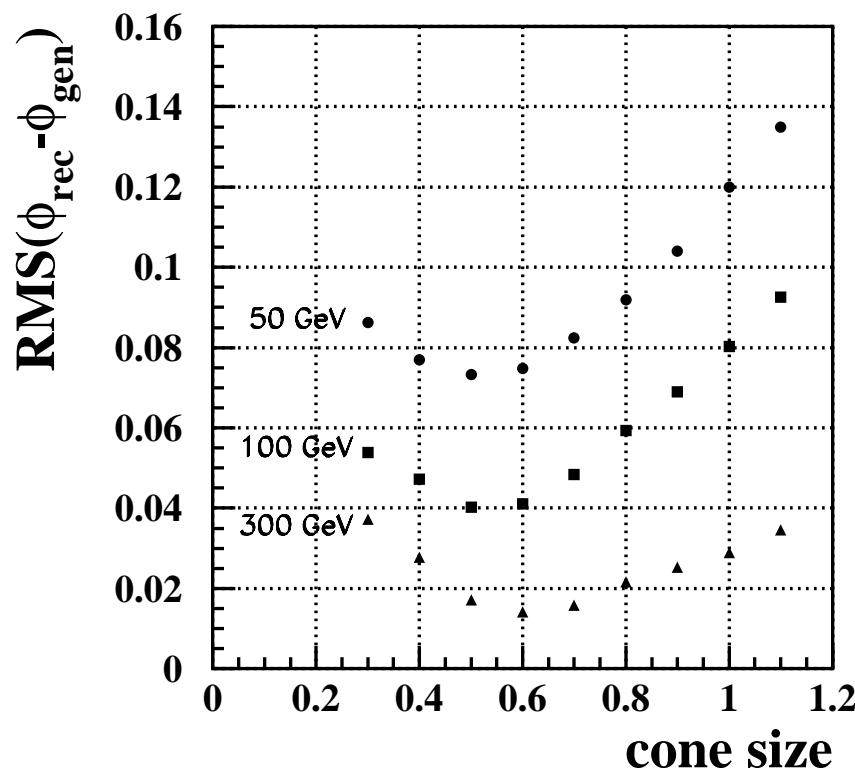
Central jets with $|\eta| < 1$ are used in the analysis.

I try different cone sizes to reconstruct jets in the calorimeter with the same iterative cone algorithm to see which reconstruction cone size is better to approximate particle jets found with cone R=0.5 (R=0.7). Particle level jets are matched to the nearest reconstructed jets.

Two cases are studied: no pile-up and high luminosity.

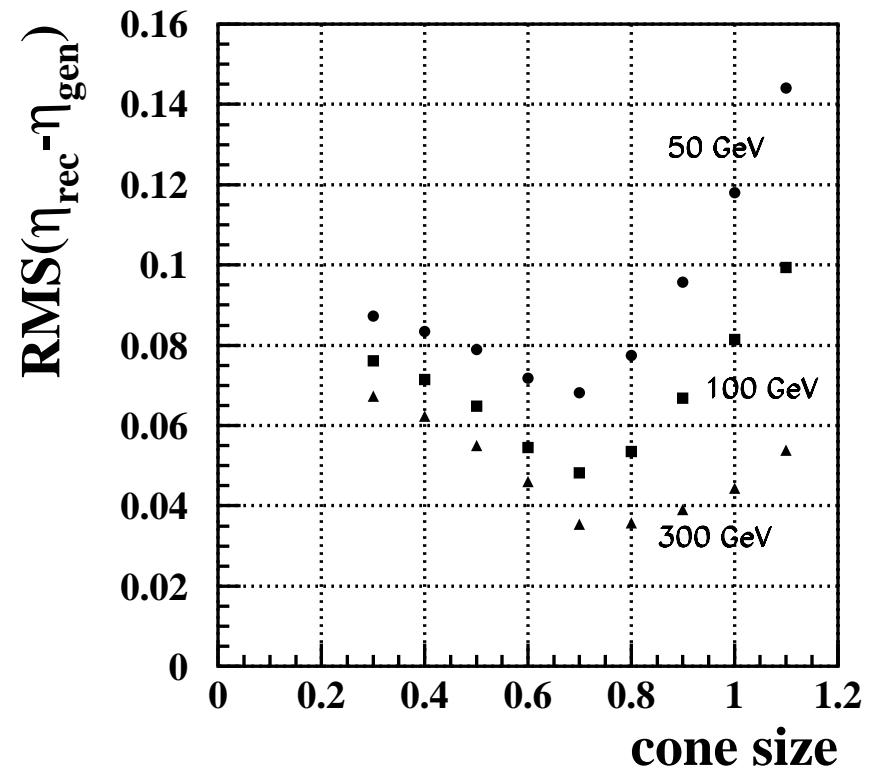
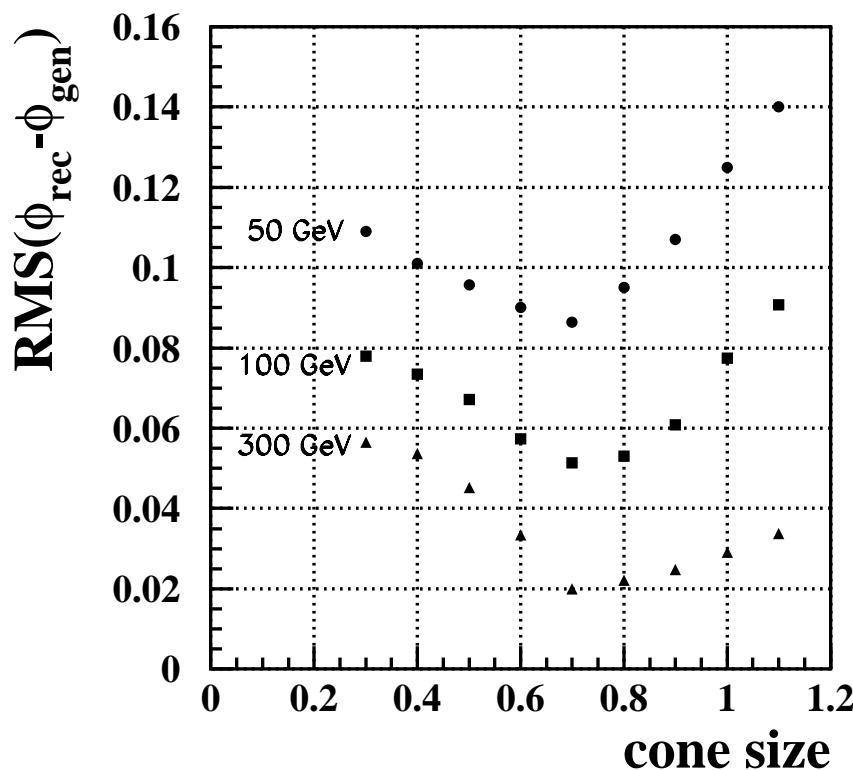
No pile-up: angular resolutions

particle level jets found with cone R=0.5

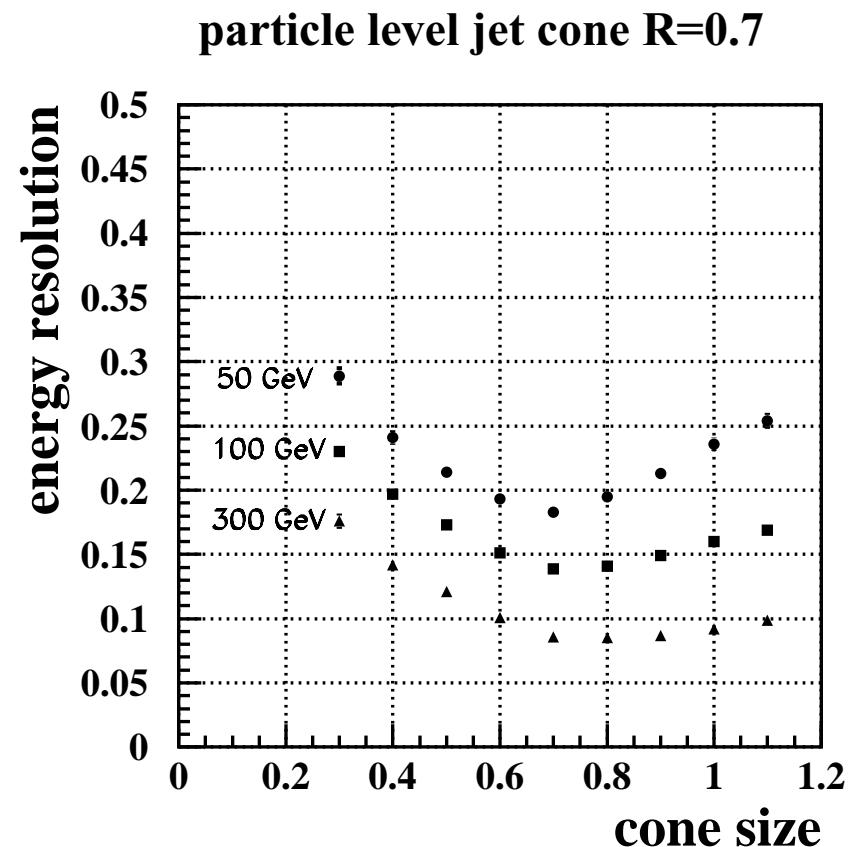
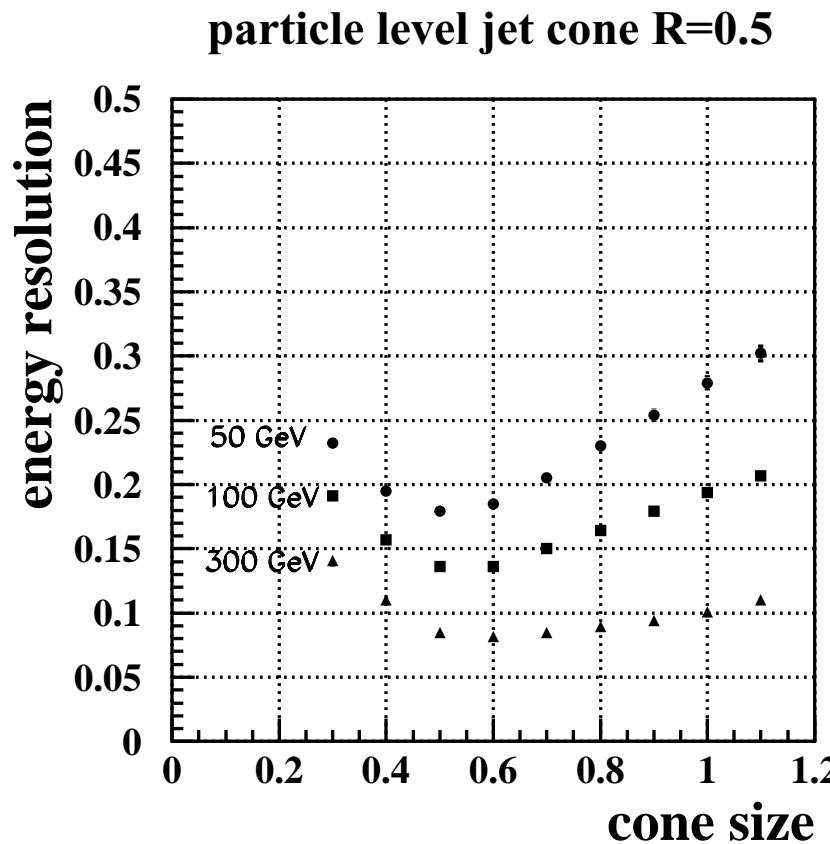


No pile-up: angular resolutions

particle level jets found with cone R=0.7

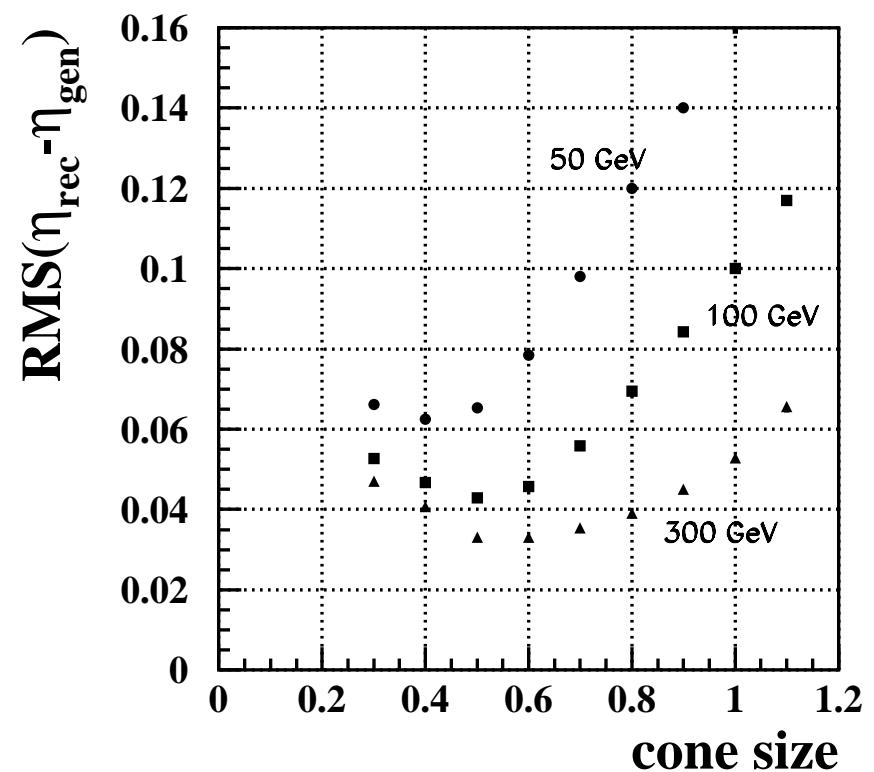
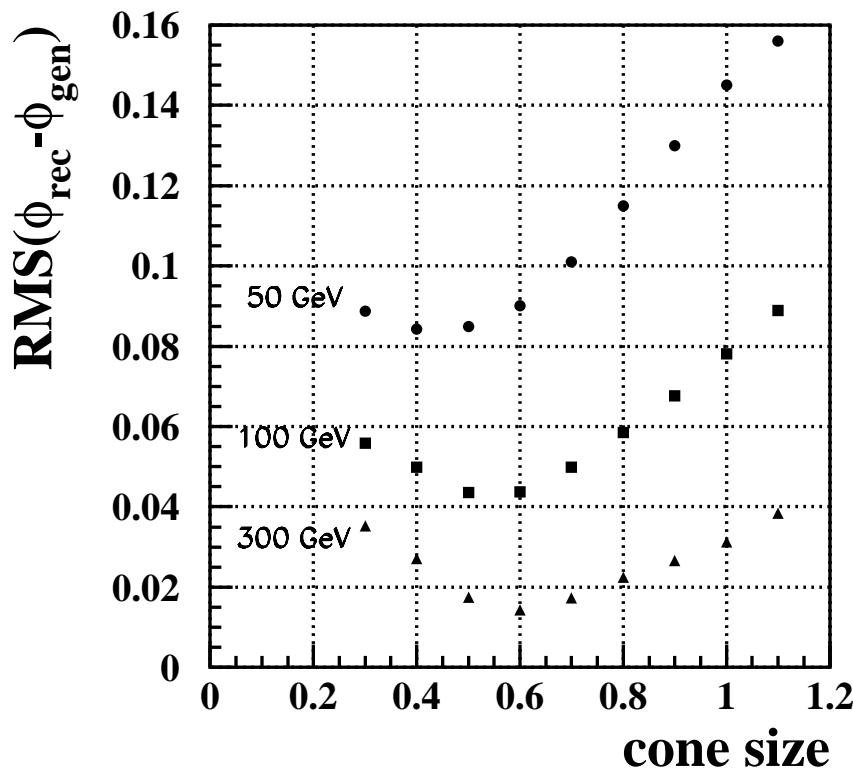


No pile-up: energy resolution



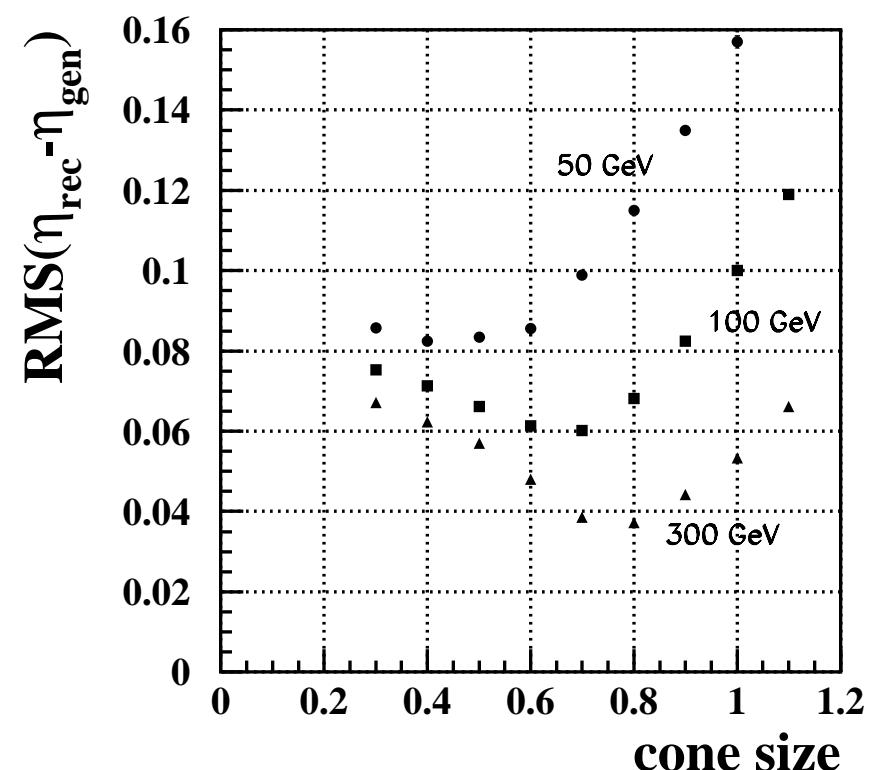
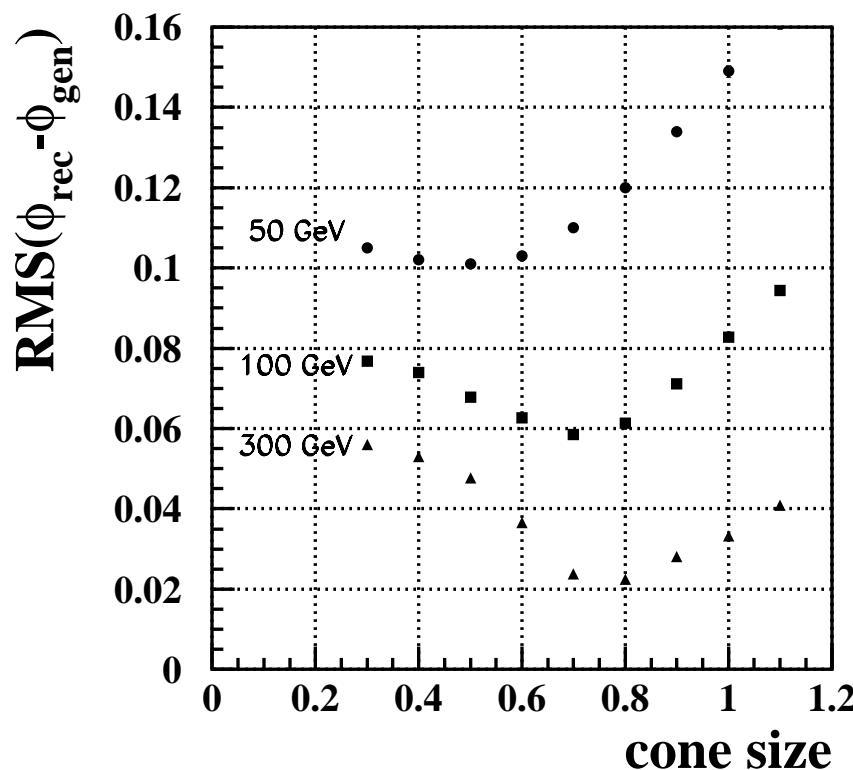
High luminosity: angular resolutions

particle level jets found with cone R=0.5



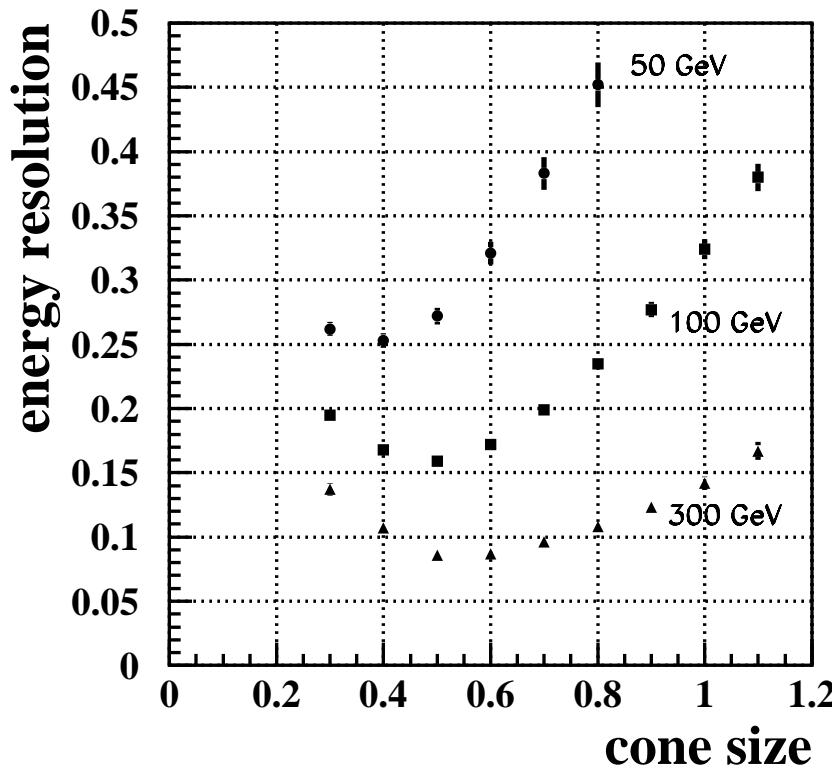
High luminosity: angular resolutions

particle level jets found with cone R=0.7

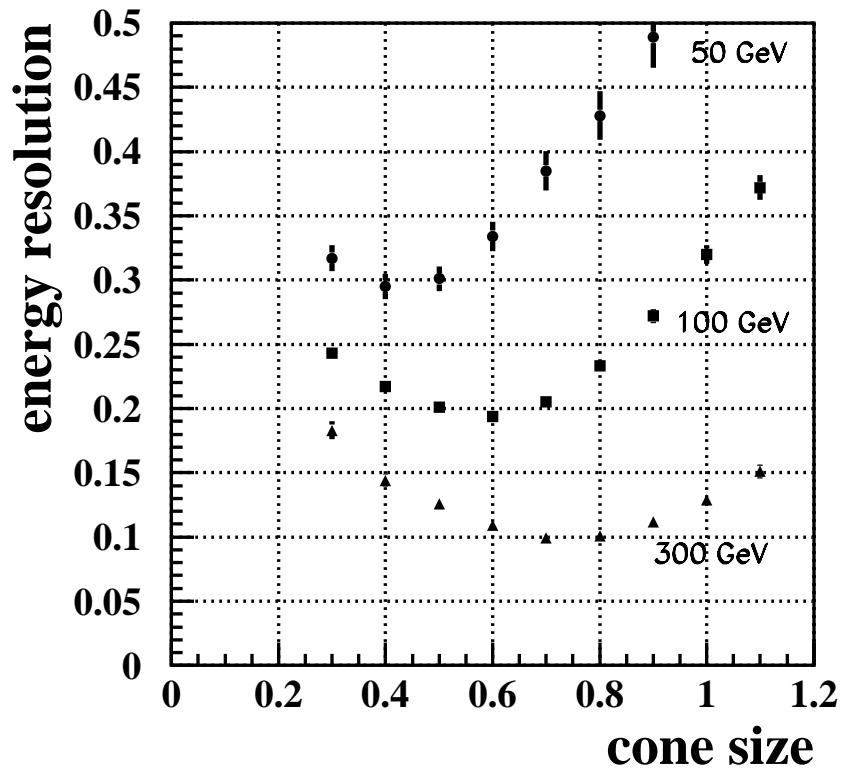


High luminosity: energy resolution

particle level jets cone R=0.5



particle level jets cone R=0.7



Summary

A single cone size value optimizes the jet reconstruction both in terms of angular and energy resolutions.

In the no pile-up case (and presumably under the low luminosity conditions) an optimum jet reconstruction is achieved with a cone size approximately equal to that of particle jets. So the choice of a jet reconstruction cone size should be mainly dictated by jet physics.

In the high luminosity case low energy jets (as high as 50 GeV) are significantly affected by pile-up. Smaller cone sizes result in essential resolution improvements. Unless we try an event by event pile-up subtraction it's unlikely we need to use cone sizes larger than 0.5 for jets below 50 GeV.